ties, among which these seem to be the best supported, namely, that alcohol favors change of the average reaction time from its normal amount, and that there seems to be no constant and direct connection between the reaction time, either "in quantity or in quality," and the taking of alcohol. These experiments were made before attention had been called to the distinction between what Wundt calls motor and sensory reactions, that is, between those that are automatic and those (distinctly slower) that are accompanied by full psychic processes. The figures found for the normal reactions, from 0.1398 s. to 0.2001 s., would mark them as of the intermediate or mixed class from which uncertain results are apt to follow. The action of the stimulant in inclining the subject toward the motor or sensory form of reaction is not known; it may differ from subject to subject, or even with the same subject at different times. Absolutely irreproachable experiments on reaction-times are not easy to carry out, and certain conditions of experiment perhaps have been too little regarded in these.

The new chronoscope described is an improved form of the Exner Neuramœbimeter (Psychodometer of Obersteiner) designed by Prof. H. P. Bowditch. In both instruments the time measurement depends on tuning-fork vibrations; in the earlier one the fork carried the writing point, and a smoked plate was moved beneath it; in the new one the fork carries a smoked card and is drawn backward; the writing point is fixed, except as its movements are controlled by an electro-magnet. A chief advantage of the new instrument is that the subject of experiment can be placed at a distance and out of the range of any disturbing noise from it.

Experiments on Tetanus and the Velocity of the Contraction Wave in Striated Muscle. JOHN P. CAMPBELL. Studies from the Biol. Lab. J. H. U., Vol. IV, No. 3.

The muscles experimented on were the neck retractors of the terrapin, their length and character making them unusually appropriate for such work. The author set himself to determine, first, the least number of stimuli per second required for tetanus, and second, the rate of transit of the wave of contraction. The curarized muscle at 4° C. loaded with about 8 gr. and stimulated by an induction shock once per second, showed tetanus; at 9° five shocks were required, at 21° twenty-five, and at 28° thirty-four. The curarized gastrocnemius of a frog at 25½° required thirty-seven stimuli per second, ten more than the highest figure before given; a difference due, in the opinion of the author, to the sensitiveness of the apparatus used. The character of the muscle itself is also a factor; its influence is thus generalized: "the more extensible a muscle is, the fewer stimuli per second will suffice to tetanize it." In varying the strength of the stimuli, it was found that those which singly were too slight to produce contraction might result in tetanus if repeated with sufficient rapidity. The rate of propagation was found to be from 2 m. to 2.62 m. per second, with a rapid decline through fatigue (and an increase with increase of load). As regards the direction and rate of stimulation between the electrodes, the experimenter found that, except when very strong, it starts from the cathode and goes toward the anode at a rate much greater than elsewhere in the muscle, as high in fact as 13 m. per second. Some of

the apparatus used was of improved form originating with the author.

The Reinforcement and Inhibition of the Knee-jerk. H. P. BOWDITCH, M. D. Boston Med. and Surg. Journal, May 31, 1888.

The interesting experiments of which this paper is a preliminary report, had for their object the study of the effect of time upon the reinforcement of the knee-jerk. They start from the well known fact that the knee-jerk is for a time reinforced when preceded by other muscular action. The subject, having taken his position, and been connected with the recording apparatus, at a bell signal, gripped a piece of wood with his right hand. The bell signal was followed at from zero to 1.7 seconds by a regulated blow on the patellar ligament producing the jerk. The experiments were made in courses of about an hour, each embracing several series. Each series was begun by a number of simple knee-jerks, to be used as a basis of comparison with the reinforced ones that followed. The difference between the averages of these parts of a single series was known as the *special* reinforcement; that between the second part of any series and the average of all the first parts of the same course was the *general* reinforcement. In the cut which represents graphically the results of 551 normal and 624 reinforced records on four subjects, the curves for the special and general reinforcements follow nearly the same course. If the hammer stroke was less than 0.4 sec. later than the signal for clinching the hand, the extent of the knee-jerk was increased; if it was more than 0.4 sec. later, the extent was less than normal, till at about 1.7 sec. it again became normal; that is to say, by a clinching of the hand, the spinal centres for the knee-jerk are first excited, then depressed, and then gradually return to their normal condition. Says Professor Bowditch: "We have in this alternating action a phenomenon which cannot fail to throw light upon the nature of 'inhibition,' and [is] destined perhaps, when fully understood, to establish the interference theory on a firm basis."

Ueber die Wahrnehmung der Geräusche. ERNST BRÜCKE. Wien. Sitzb. 3te Abth., XC (1884), pp. 199–230.

On the ground of certain experiments, Exner published the conclusion, in 1876, that we hear tones and noise with the same organs. The present paper is a further study of the same question, made by the author in connection with Profs. Exner and Fleischl. If this conclusion is true, and both are perceived with the same structure of the ear, they should show points of similarity. And such they do, both in common experience (witness the representation of cannonading by drum strokes), and in suitable experiments more clearly still. Experiments were begun on explosive noises as the simplest. Having adapted a flame and rotating mirror to the study of such sound waves, the author first tried the report given in forcing a rubber stopper out of lead tubes of various lengths by compressed air, which proved to be a series of waves of decreasing intensity; and later, the explosion of soap-bubbles of hydrogen and air, which gave a solitary wave. Discriminations of high and low could be made with both, corresponding with the length of the tube and the size of the bubble, as should be the case if the noises are heard with